Vibrating Concrete

Source: Concrete Construction, May 2005

Proper Internal Vibration

- Increases compressive strength and bond between concrete and rebar and decreases concrete permeability
- Decreases cold joints, honeycombing, excessive entrapped air, and segregation
- Causes concrete within a circular field of action to act like a liquid

How to Vibrate

- Insert vibrator vertically, allowing it to penetrate rapidly to the bottom of the lift and at least 6 inches into the previous lift
- Hold it at the bottom of lift for 5 to 15 seconds
- Pull vibrator up at a rate of 15 seconds for a 4-foot lift, or about 3 inches per second

Spacing Tips

- Space out the Insertion of the vibrator so the fields of action overlap
- Watch the concrete to determine the vibrator's field of action
- High-powered vibrators and high slump concrete have larger fields of action
- Rule of thumb: the radius of the field of action is four times the vibrator's head diameter. Therefore, for a 1-inch pencil vibrator, the diameter of the field of action is about 8 inches. Accordingly, in ICF typically you should vibrate every cell between webs.

Stop Vibrating when:

- The concrete surface takes on a sheen
- Large air bubbles no longer escape
- You hear the vibrator change pitch or tone
- You feel a change in vibrator action

Vibrating Don'ts

- Don't let a vibrator run very long outside of the concrete – it will overheat and fail
- Don't force or push a vibrator into concrete; it won't remain vertical and may get caught in the reinforcing steel
- Don't start a job without a spare vibrator

Revibrating Concrete

Revibrating concrete momentarily liquifies the concrete again. The primary chemical process that occurs in the first 2 hours after concrete is placed is the formation of calcium hydroxide, which typically makes up 15 to 25 percent of ordinary portland cement concrete. The other major product of hydration is calcium silicate hydrate, which usually makes up about 50 percent of ordinary portland cement concrete and gives the concrete its hardness and durability. Formation of calcium silicate hydrate begins in earnest only after several hours have elapsed.

Somewhere in that process, the concrete reaches initial set, defined as a compressive strength of 500 psi. After initial set, formation of the more brittle, weaker calcium hydroxide continues but falls behind the calcium silicate hydrate formation, which accelerates dramatically between initial set and final set, defined as 4000 psi. (See "time of setting" in ASTM C125, which covers concrete terminology.)

When revibration occurs after the initial set, it breaks down some of the calcium hydroxide that has already been formed. That allows freshly placed concrete adjacent to the revibrated concrete to join with it, rather than introducing a construction joint, and it again becomes a monolithic concrete structure.

Revibration of concrete has been an accepted construction method for more than 50 years. An article from CONCRETE CONSTRUCTION in February 1959 provided an overview of the practice and concluded by saying: "Concrete will benefit from revibration at any time provided the concrete is sufficiently plastic to permit the running vibrator to sink of its own weight." Although we've learned more since then about what is going on in concrete as it hardens, the benefits of revibration have not changed. *Source: Concrete Construction, March 2004*